

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: CY100

Course Name: ENGINEERING CHEMISTRY

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 2 marks.

- | | Marks |
|---|-------|
| 1 | (2) |
| Which of the following molecules show UV-visible absorption spectrum?
Explain(a) methane (b) benzene (c) 1,3-butadiene (d) cyclohexene | |
| 2 | (2) |
| Calculate the amount of electric energy available from a dry cell which consume 6.55g Zn. given that emf of the cell is 1.5 V and atomic weight of Zn is 65.5 u | |
| 3 | (2) |
| Explain elution. | |
| 4 | (2) |
| What is ABS? | |
| 5 | (2) |
| Calculate the HCV of CH ₄ using Dulong's formula. | |
| 6 | (2) |
| Why graphite can act as a solid lubricant? | |
| 7 | (2) |
| Define temporary and permanent hardness of water with examples. | |
| 8 | (2) |
| Give the advantages and disadvantages of chlorination of water. | |

PART B

Answer all questions, each carries 3 marks.

- | | |
|--|-----|
| 9 | (3) |
| Sketch the molecular orbital energy diagram of 1,3 butadiene and show HOMO and LUMO transition. What happens to wavelength of absorption maximum when more double bonds come in conjugation? | |
| 10 | (3) |
| What are the functions of a salt bridge? | |
| 11 | (3) |
| List out the applications of TGA. | |
| 12 | (3) |
| Sketch OLED display device, Which region (p or n) is emissive layer, why? | |
| 13 | (3) |
| What are Greases? Where they are used? Give the composition of calcium-based grease and axial grease. | |
| 14 | (3) |
| Define a chemical fuel. How are they classified? Give suitable examples. | |
| 15 | (3) |
| Explain the steps involved in the treatment of water for drinking purpose. | |
| 16 | (3) |
| Define COD and BOD. Why COD is always greater than BOD? | |

PART C

Answer all questions, each carries 10 marks.

- | | |
|---|-----|
| 17 | (5) |
| a) State Beer-Lambert's law and derive its integrated form. | |
| | (5) |
| b) Draw high resolution NMR spectrum of CH ₃ -CH ₂ -O-CH ₂ -CH ₃ . Explain the reason for chemical shift and spin-spin splitting pattern. | |

- 18 a) Discuss the number of vibrational modes in HCl, CO₂ and H₂O molecules, sketch them. (5)
- b) Give the expression for vibrational energy of a diatomic molecule, draw the energy level diagram. (5)
- 19 a) Derive Nernst's Equation for half-cell and complete cell. (6)
- b) What is a reversible cell? Give one example each for reversible cell and irreversible cell. (4)

OR

- 20 a) What is potentiometric titration? How will you follow the end point of an acid base titration potentiometrically? (6)
- b) How redox titrations are done potentiometrically? Explain with an example. (4)
- 21 a) Explain the instrumentation and working of TGA with a neat labelled diagram. (5)
- b) Discuss the role of thermo gram in TGA analysis using suitable example. (5)

OR

- 22 a) Explain the principle and instrumentation of gas chromatography with a labelled diagram. (5)
- b) Define i) Gas chromatogram ii) Retention time. (3)
- c) Mention the applications of Gas chromatography. (2)
- 23 a) What are carbon nanotubes? Give the classification, What are the important properties? Give any two applications. (5)
- b) What is Kevlar? Give two important applications. (5)

OR

- 24 a) What is silicone rubber? How is it prepared? Give any two methods of vulcanisation of silicone rubber. Give two impotent applications. (6)
- b) Give the structure of Kevlar. Show the Hydrogen bonding between the chains. (4)
- 25 a) A sample of coal contains C = 93%, H = 6%, and Ash=1%. The following data were obtained when the above coal was tested in Bomb calorimeter. 1) Weight of coal burned = 0.92gm 2) Weight of water taken = 2200gm 3) water equivalent of Bomb calorimeter = 550gm 4) rise in temperature = 2.42°C 5) Fuse wire correction = 10cal 6) Acid correction= 50cal. Calculate the Gross and Net calorific value of the coal sample. (5)
(Latent heat of condensation of steam = 580cal/kg.
- b) Differentiate between vegetable oil and mineral oil lubricants. (5)

OR

- 26 a) Enumerate the important characteristics of good fuel. (5)
- b) How is aniline point determined? Why do we say a higher aniline point is desirable for lubricants? (5)

- 27 a) Describe the process of demineralization of water using ion-exchange resins with equations. (6)
- b) Compare aerobic and anaerobic oxidation of sewage water. (4)

OR

- 28 a) Explain the principle and procedures of EDTA method with equations. (6)
- b) 50 ml of a water sample requires 9 ml of an EDTA solution for the titration. 11 ml of the same EDTA solution was required for the titration of 50 ml of standard hard water containing 1 gm of CaCO_3 per litre. Calculate the hardness of water sample in ppm. (4)
